

KORG

PORTABLE ORGAN

CX-3

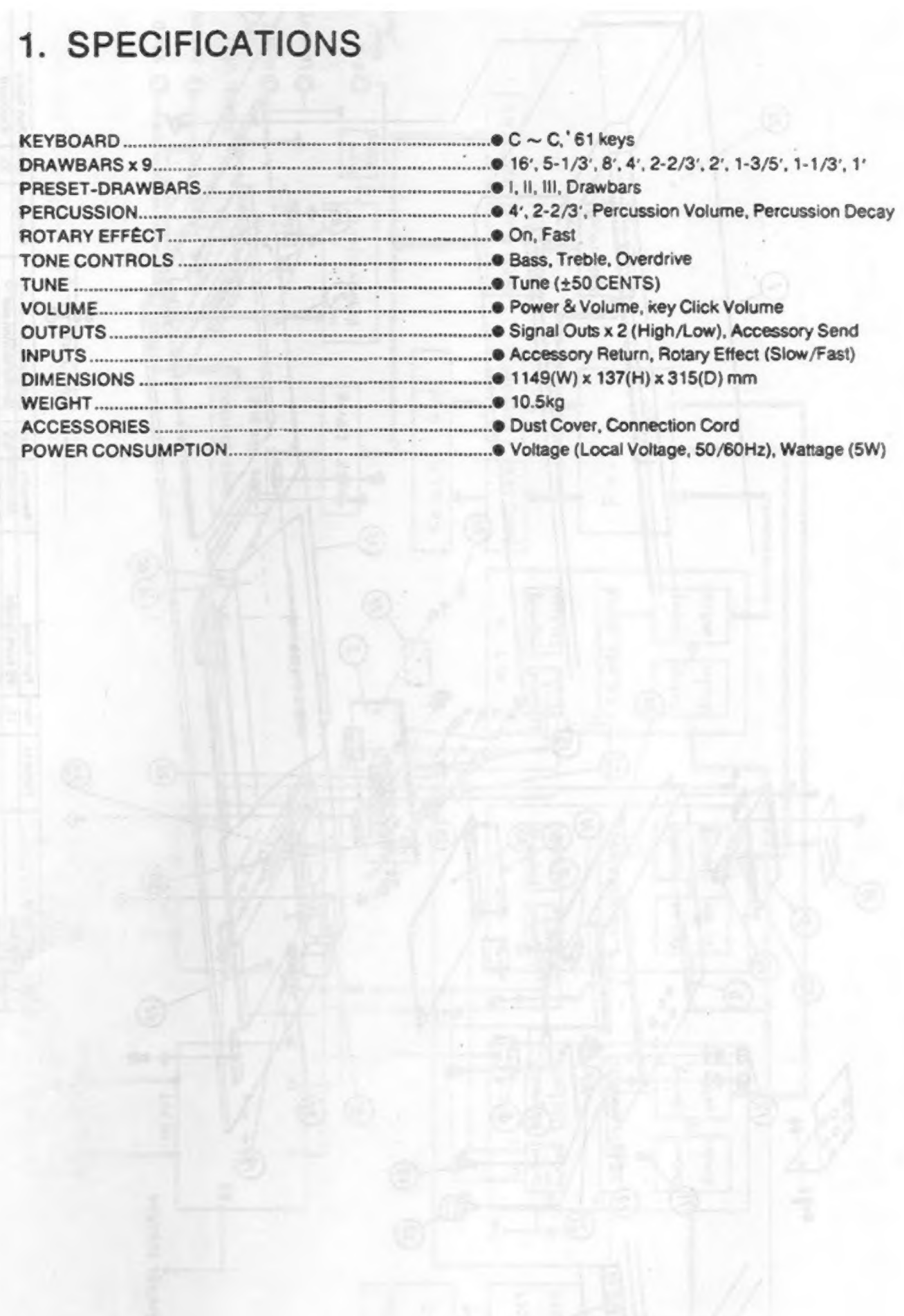
Service Manual

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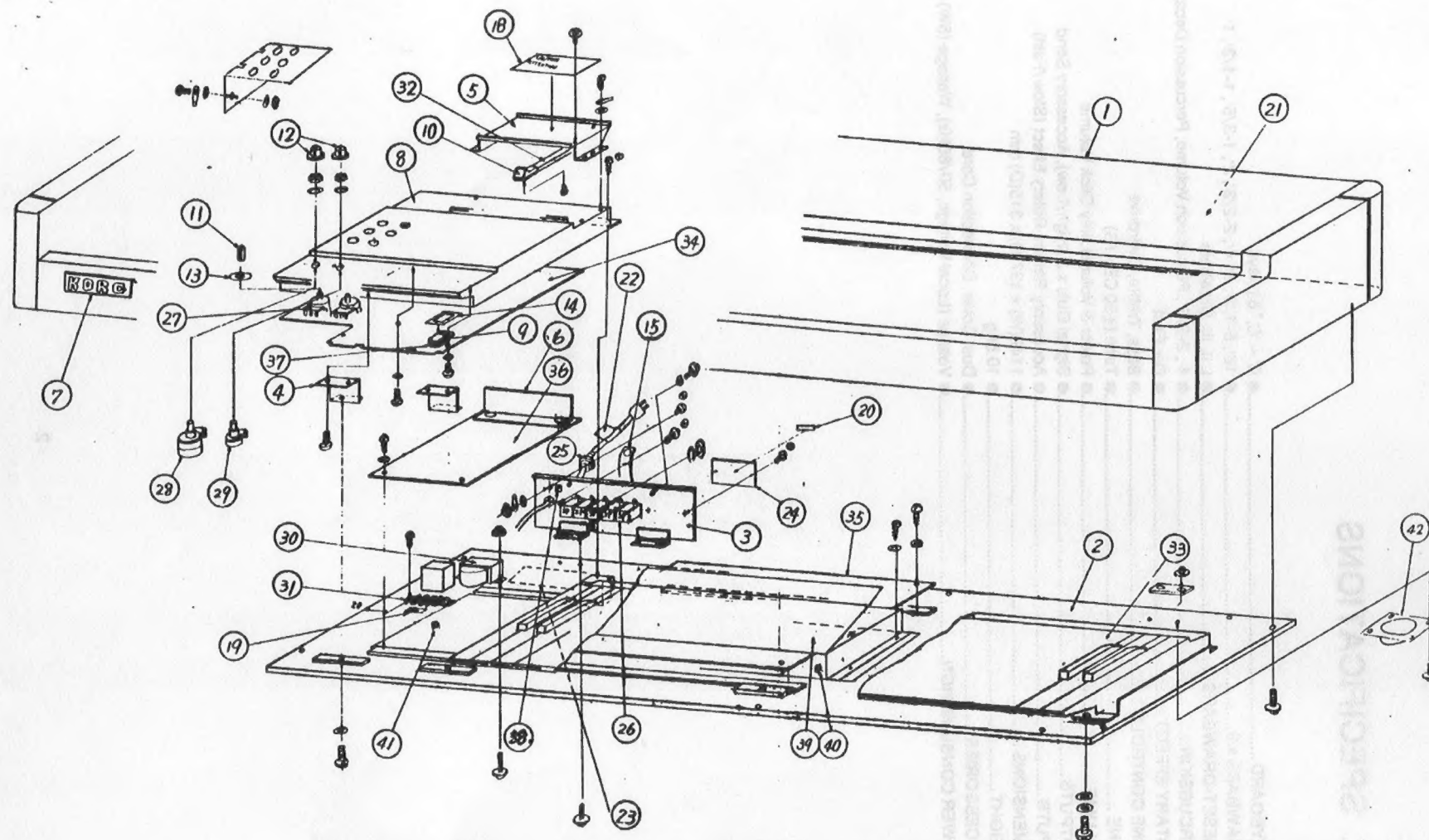
KEIO ELECTRONIC LABORATORY CORPORATION
TOKYO/JAPAN

1. SPECIFICATIONS



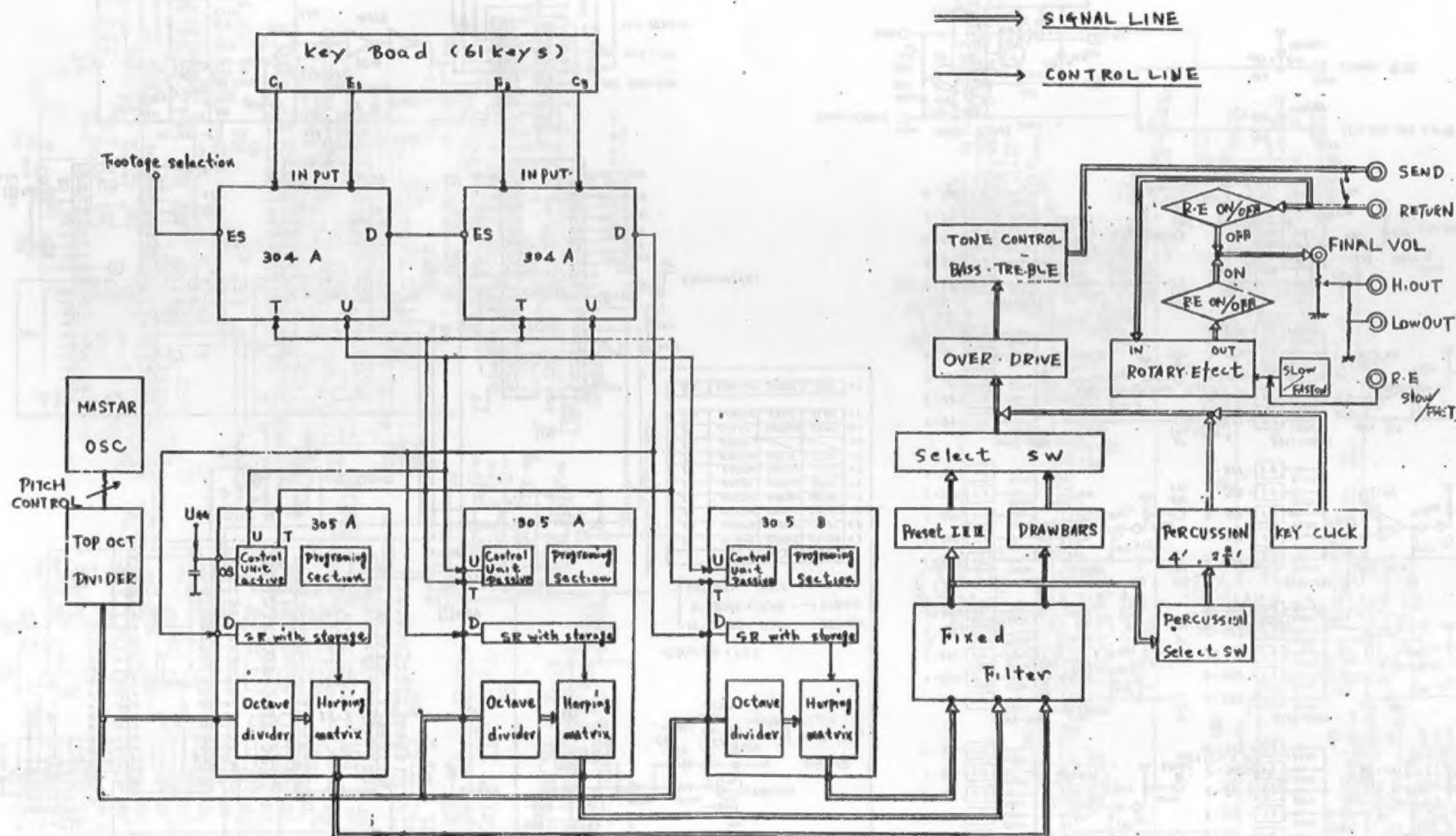
| | |
|-------------------------|---|
| KEYBOARD | ● C ~ C, ' 61 keys |
| DRAWBARS x 9 | ● 16', 5-1/3', 8', 4', 2-2/3', 2', 1-3/5', 1-1/3', 1' |
| PRESET-DRAWBARS | ● I, II, III, Drawbars |
| PERCUSSION | ● 4', 2-2/3', Percussion Volume, Percussion Decay |
| ROTARY EFFECT | ● On, Fast |
| TONE CONTROLS | ● Bass, Treble, Overdrive |
| TUNE | ● Tune (±50 CENTS) |
| VOLUME | ● Power & Volume, key Click Volume |
| OUTPUTS | ● Signal Outs x 2 (High/Low), Accessory Send |
| INPUTS | ● Accessory Return, Rotary Effect (Slow/Fast) |
| DIMENSIONS | ● 1149(W) x 137(H) x 315(D) mm |
| WEIGHT | ● 10.5kg |
| ACCESSORIES | ● Dust Cover, Connection Cord |
| POWER CONSUMPTION | ● Voltage (Local Voltage, 50/60Hz), Wattage (5W) |

2. STRUCTURAL DIAGRAM

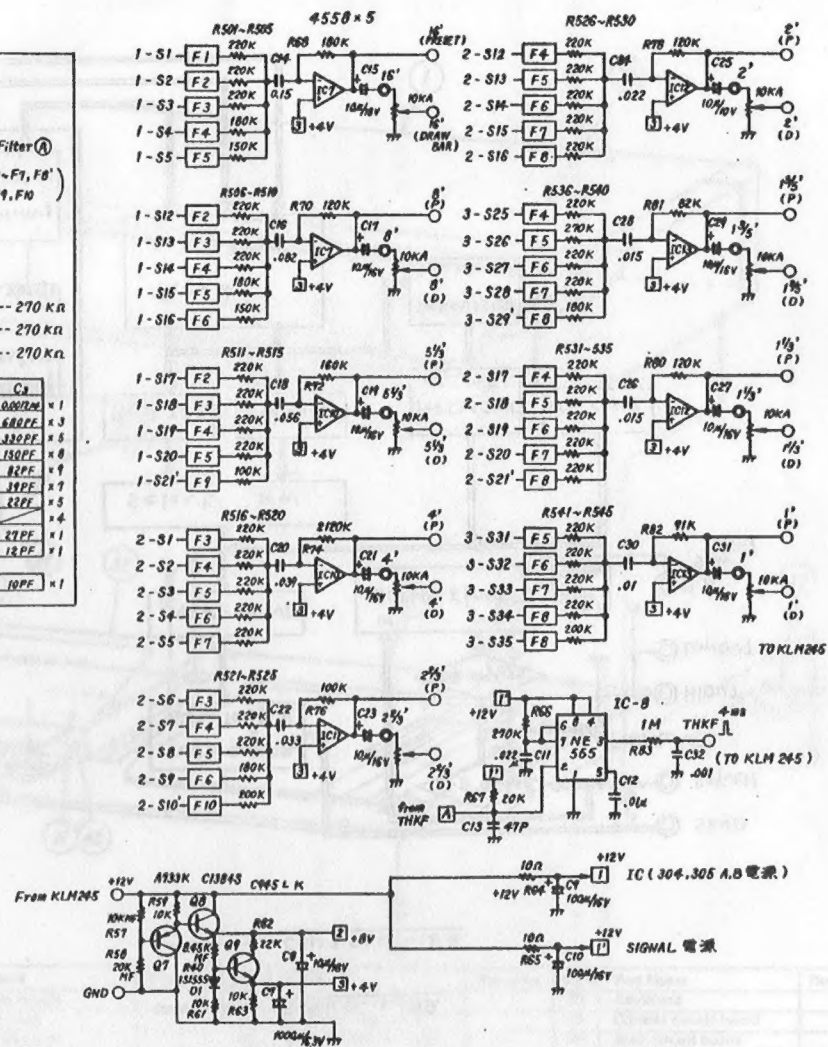


| Item | Part Name | Remarks | Item | Part Name | Remarks | Item | Part Name | Remarks | Item | Part Name | Remarks |
|------|------------------------|---------|------|------------------------|---------|------|---------------------------|---------|------|------------------------|---------|
| 1. | Cabinet | | 11. | PS knob (small) | | 23. | Service caution seal | | 33. | Keyboard | |
| 2. | Bottom | | 12. | Rotary knob | | 24. | Model number plate | | 34. | Control circuit board | |
| 3. | Rear panel | | 13. | Lever SW. mask | | 25. | Strain release bushing | | 35. | Main circuit board | |
| 4. | Control panel mounting | | 14. | Selector SW mask | | 26. | Phone jack | | 36. | R.E. Circuit board | |
| 5. | Draw bar holder | | 15. | Cord stopper | | 27. | Rotary variable resistors | | 37. | Selector SW | |
| 6. | Radiation board | | 18. | Fuse caution seal | | 28. | Rotary variable resistors | | 38. | Earth (ground) seal | |
| 7. | KORG Mark (Small) | | 19. | Fuse seal | | 29. | Rotary variable resistors | | 39. | Sealed cover | |
| 8. | Control panel | | 20. | Serial number seal | | 30. | Power transformer | | 40. | Aluminum film | |
| 9. | Selector SW knob | | 21. | KORG Mark seal | | 31. | Lug board | | 41. | Aluminum film | |
| 10. | Draw bar knob | | 22. | Wiring caution (large) | | 32. | Draw bar | | 42. | Metal fitting of stand | |

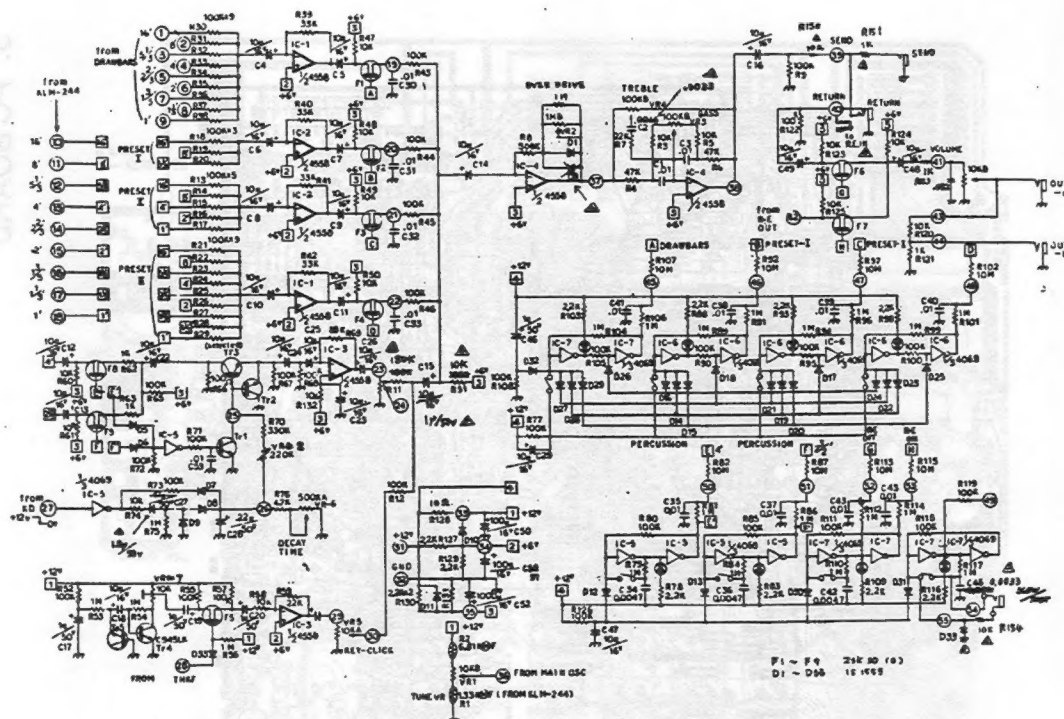
3. BLOCK DIAGRAM



KLM-244

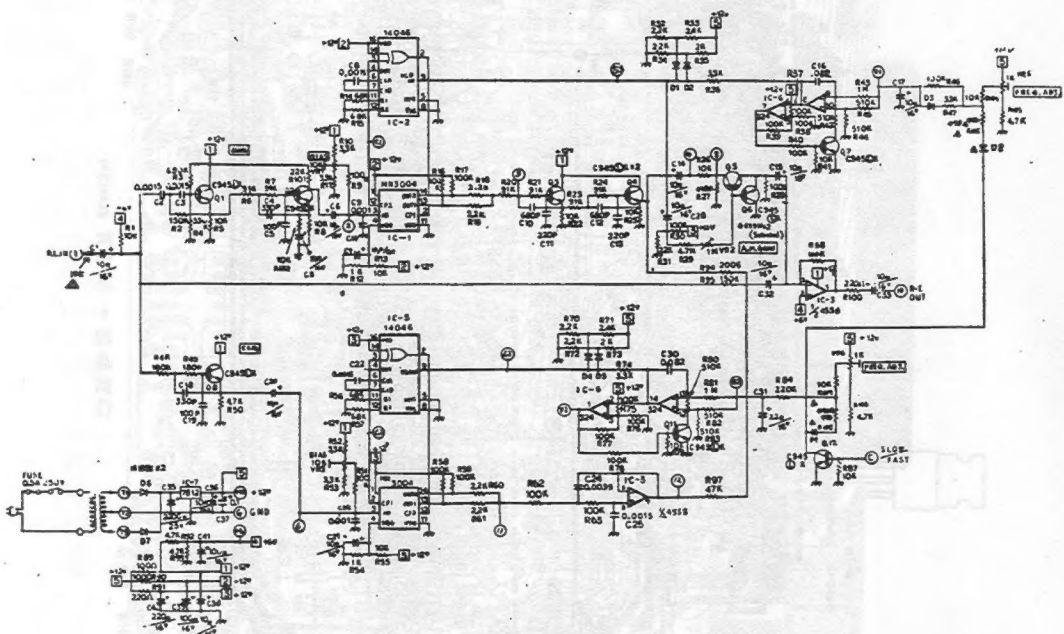


KLM-245

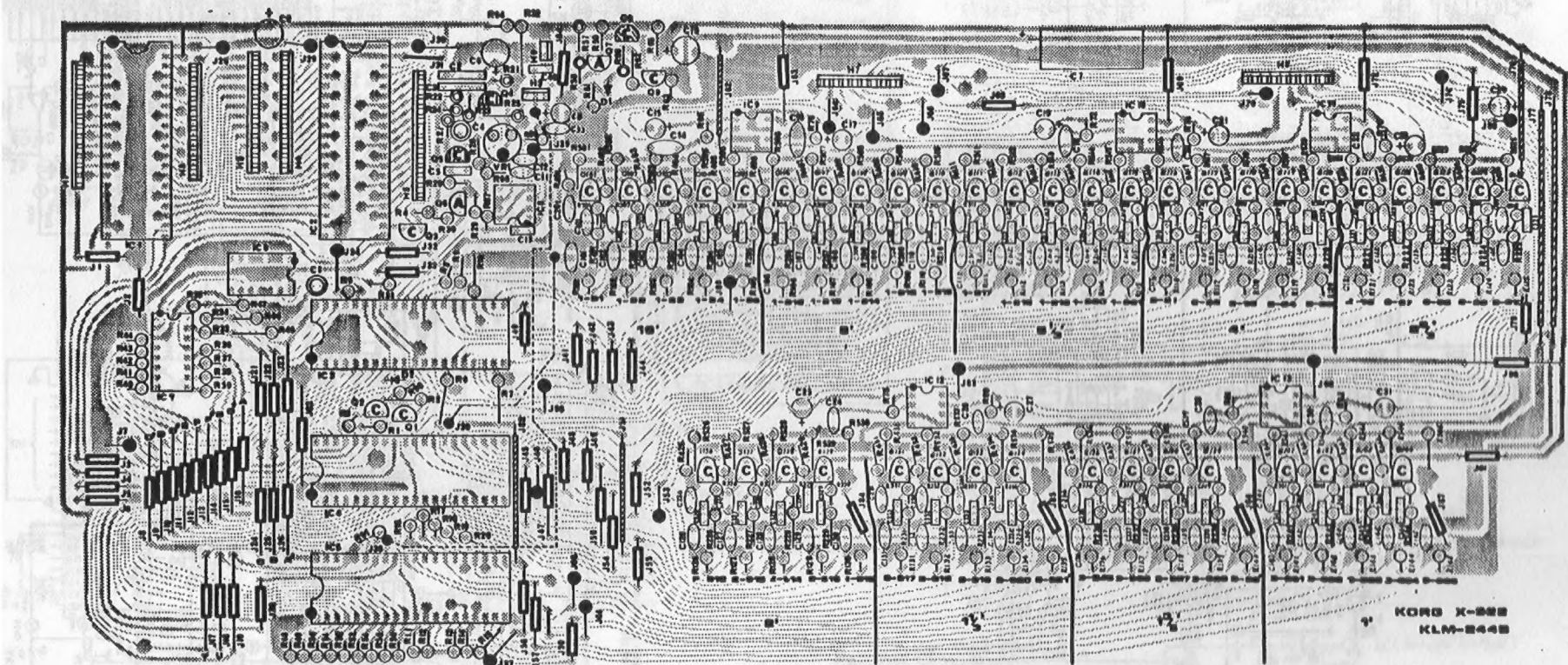


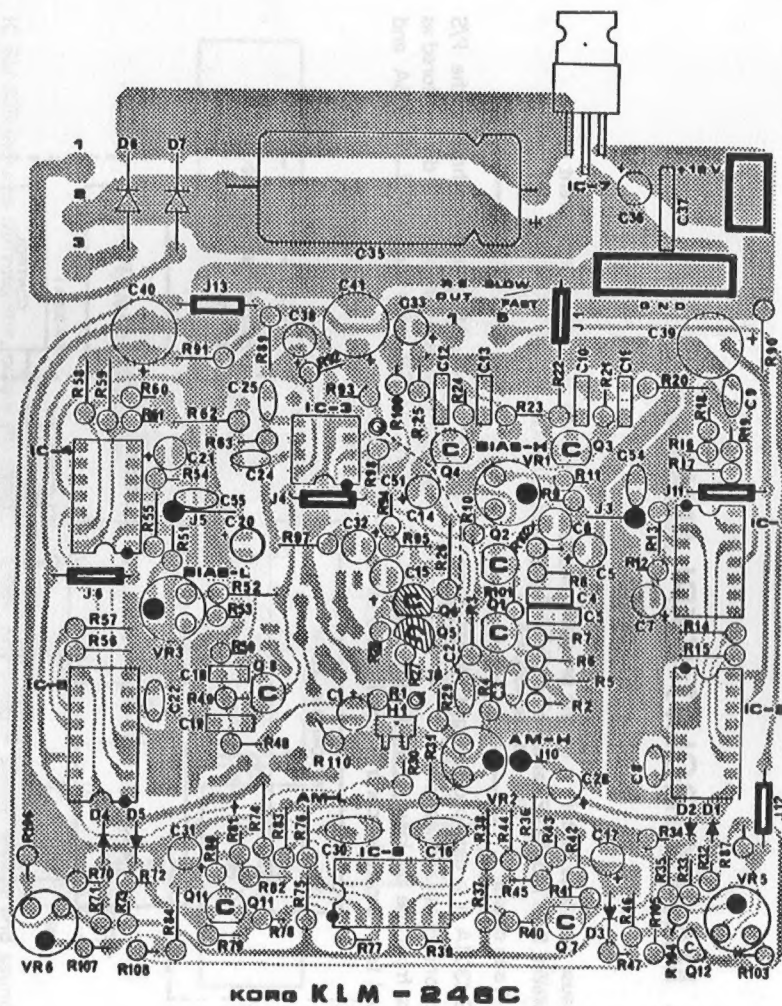
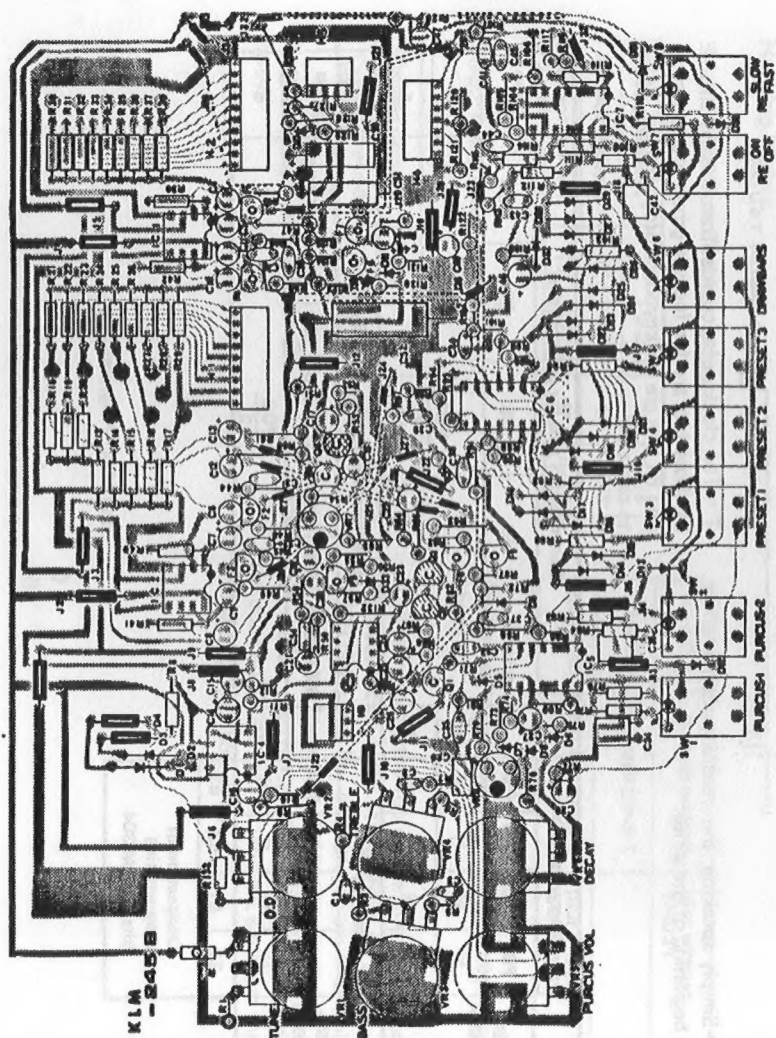
F1 ~ F4 21K 30 (0)
D1 ~ D16 15 1555

KLM-246



5. PC BOARD





6. MAIN CIRCUIT EXPLANATIONS

Because the tone circuit is of the programming type, it can be used in many different ways. However, here is only explained how the circuit is used in the CX-3.

1. Tone circuit

IC-SM304A is a data processing IC designed for electronic organ applications.

Data from the 61 keys on the keyboard is converted from a parallel control signal into a series

control signal. After passing through the P/S (parallel-to-series) converter, the data is stored as D in the SR with storage of SM-305A and SM-305B.

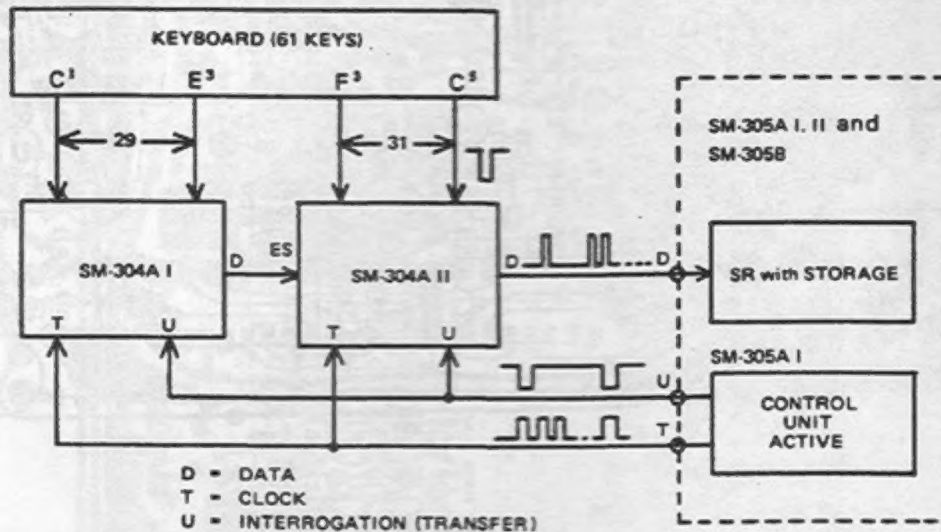


Figure 1-1 Data storage in shift register

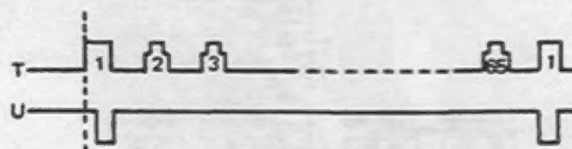


Chart 1-1 T & U timing

U = Simply speaking, the transfer pulse identifies the beginning of the series.

T = The clock pulse counts from 1 to 65 bits. 4 of those bits are for footage group programming and 61 bits are for keyboard programming. Refer to chart 1-2.

| SM-305A | Programming bits | | | | OS | Summing-out puts for programming | | | | | Footage group | | | | |
|---------|--|-----|-----|-----|---------|----------------------------------|-----|-----|-----|-----|---------------|-----|-----|---------------|-----|
| | PB1 | PB2 | PB3 | PB4 | | S10' | S9 | S6 | S7 | S8 | | | | | |
| | H | H | H | H | RC or H | $\frac{VDD}{2}$ | | | | | 3 | | | | |
| | H | H | H | H | L | | | | | | 1 | | | | |
| SM-305B | Programming bits | | | | P | Summing-outputs for programming | | | | | | | | Footage group | |
| | PB1 | PB2 | PB3 | PB4 | | S40' | S46 | S39 | S45 | S38 | S36 | S42 | S43 | | S37 |
| | H | H | H | H | H | $\frac{VDD}{2}$ | | | | | | | | 4 | |
| | ES | E1 | E2 | E3 | | | | | | | | | | | |
| | Designation of programming bits for SM-304 | | | | | | | | | | | | | | |

Chart 1-2 Programming

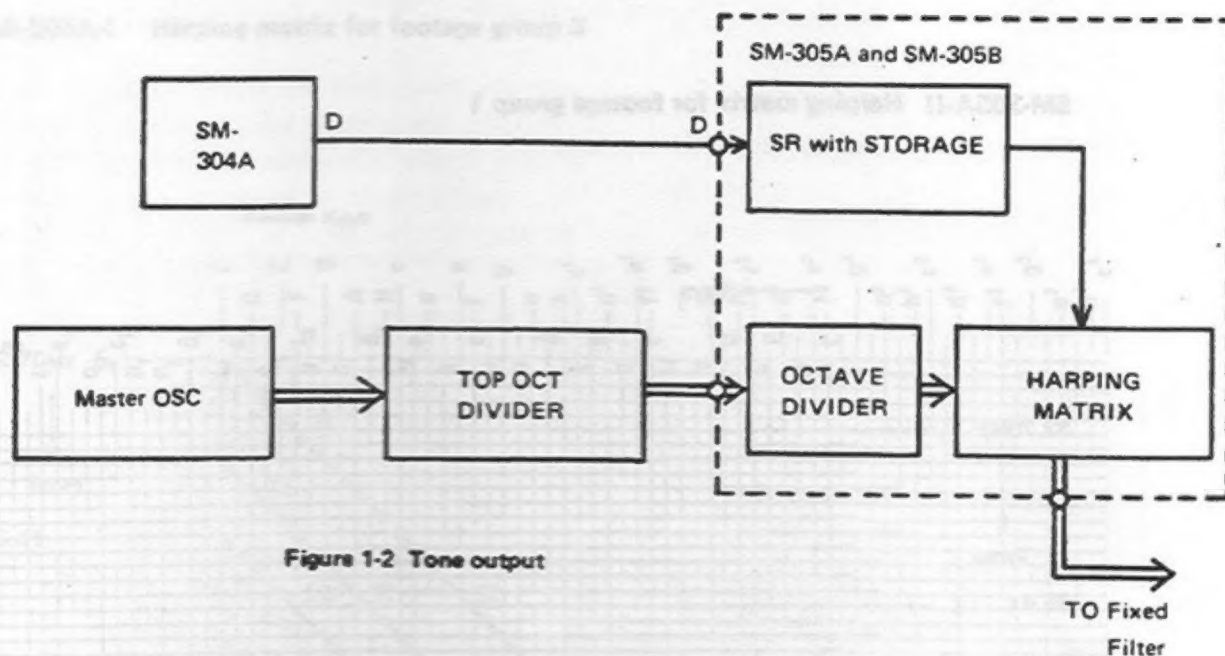


Figure 1-2 Tone output

IC SM-305 includes shift register, octave divider, and harping matrix functions.

The data that had been transferred to the shift register is now transferred to the harping matrix.

There the 12-tone octave divider and sound is produced in accordance with the data. Refer to figure 1-2.

Harping Matrix

SM-305A produces 3 footage groups.

| | | | | |
|-----------------|-----|---------|----|--------|
| Footage Group-1 | 4' | 2-2/3' | 2' | 1-1/3' |
| Footage Group-2 | 8' | 5-1/3' | 4' | 2-2/3' |
| Footage Group-3 | 16' | 10-2/3' | 8' | 5-1/3' |

SM-305B produces 2 footage groups.

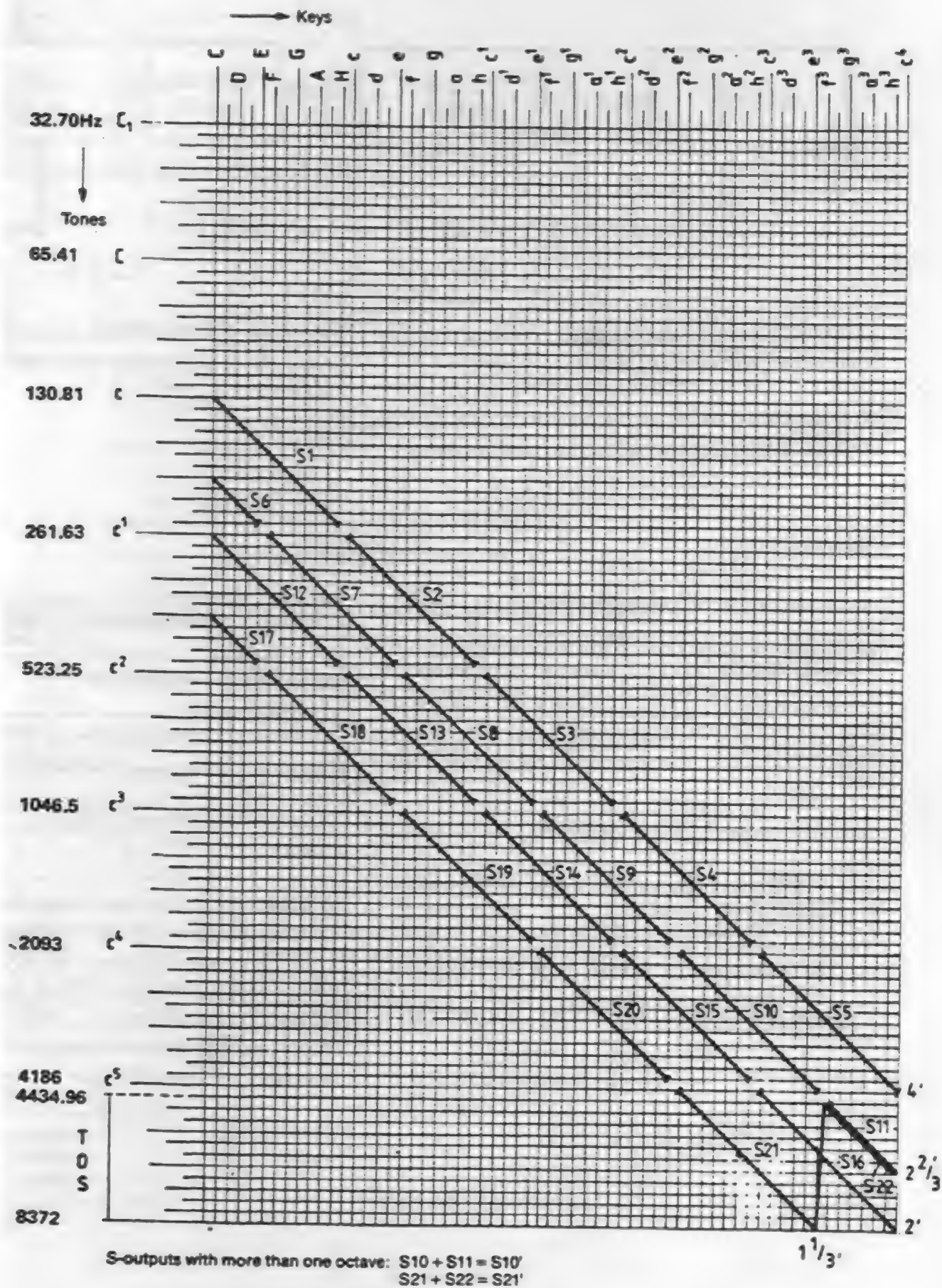
| | | | | |
|-----------------|--------|------|------|------|
| Footage Group-4 | 1-3/5' | 1' | 2/3' | 1/2' |
| Footage Group-5 | 4/5' | 1/3' | 1/4' | 1/8' |

Footage groups used in the CX-3 are as listed below.

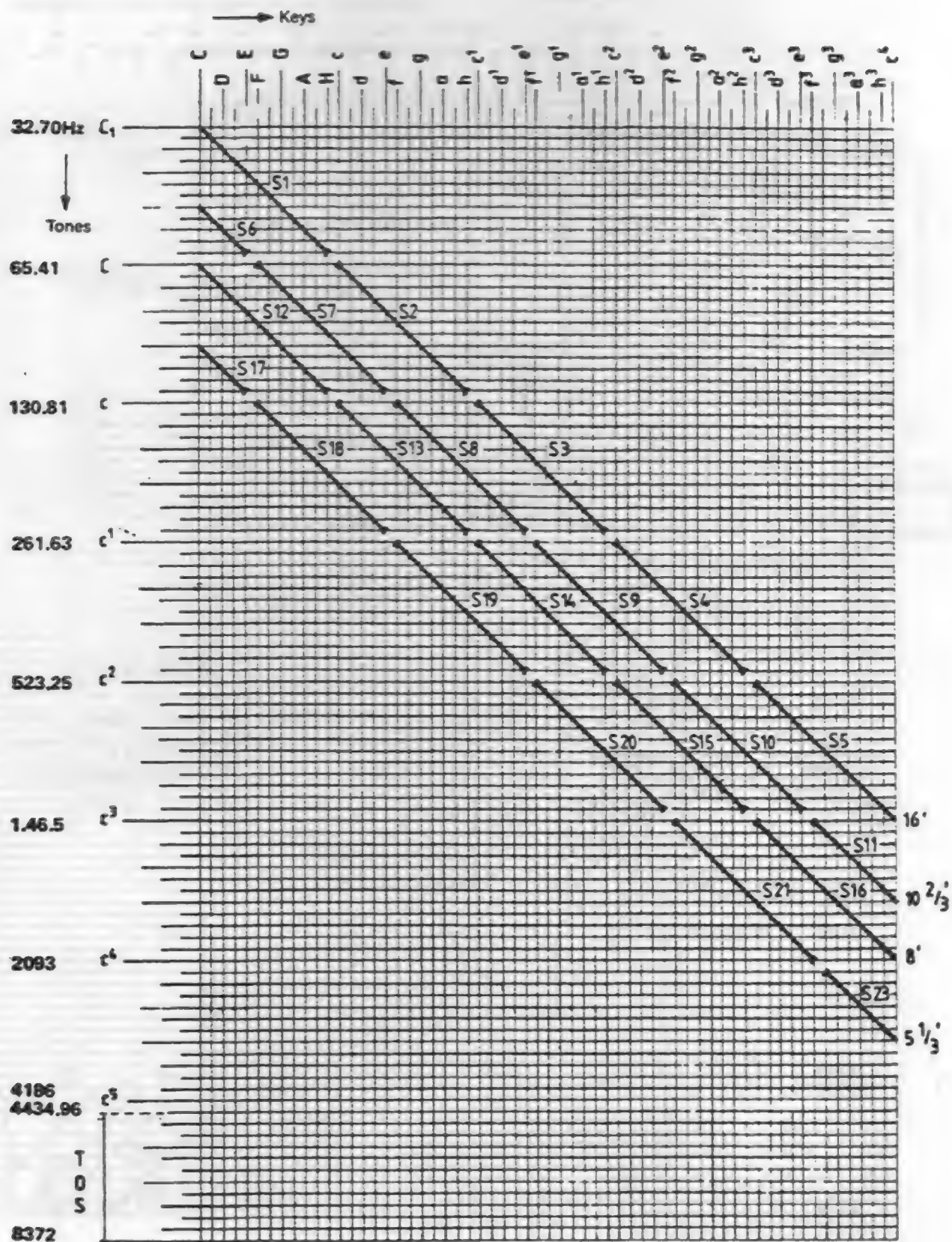
| | | |
|------------|-----------------|----------------------------|
| SM-3054-I | Footage group-3 | (But without 10-2/3') |
| SM-3054-II | Footage group-1 | |
| SM-3058 | Footage group-4 | (But without 2/3' or 1/2') |

(Refer to the Harping matrix — footage group chart)

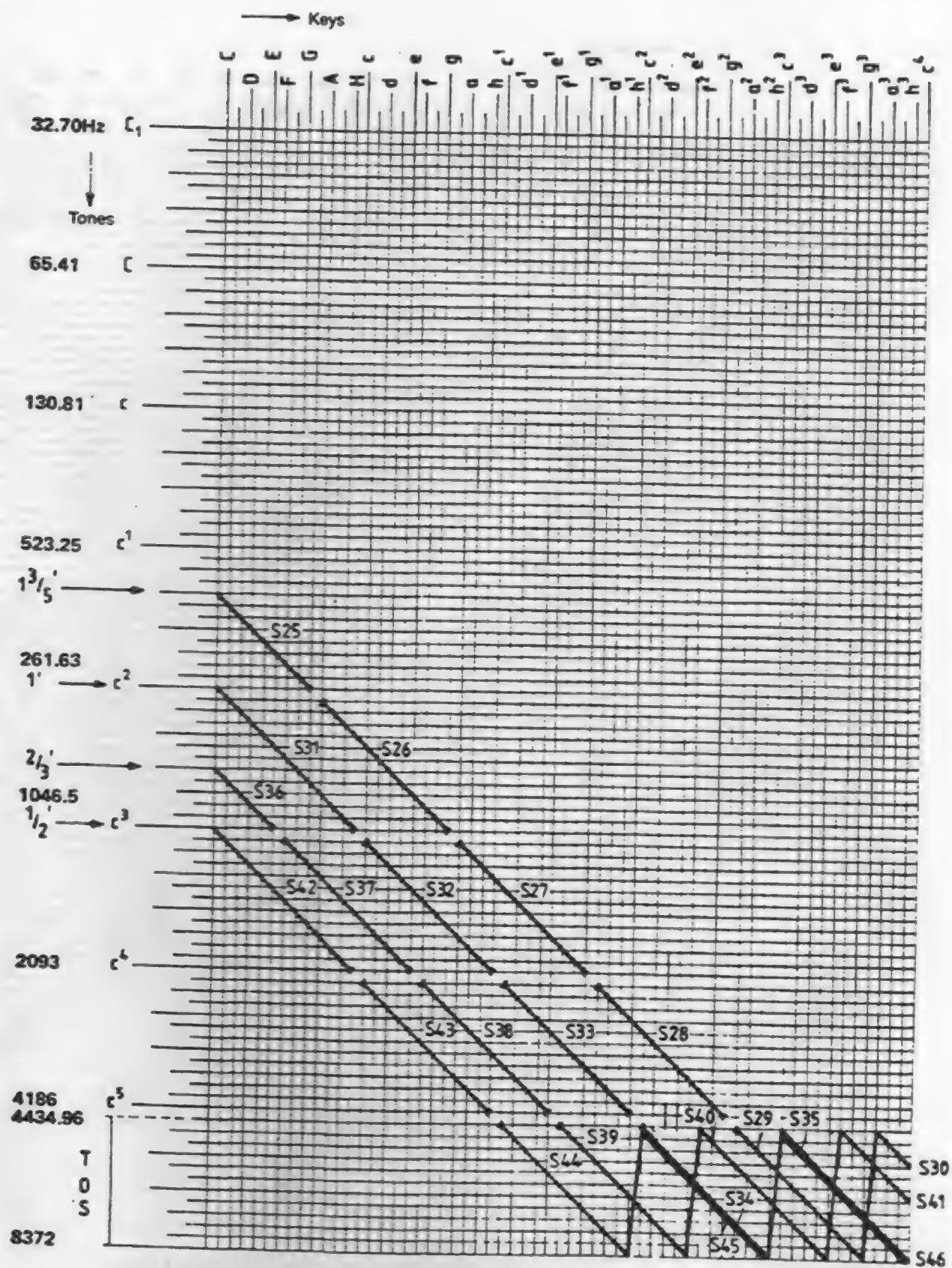
In other words, the top octave divider produces 12 frequencies — C# (4434.96Hz) D, D# . . . B, C (8372Hz) etc. For example, to get 4' C, which is 4 octaves lower, the 4186Hz is divided by 32 to obtain 130.81Hz (C). This note centered around VDD/2 is sent to tone out and from there to each of the fixed filters.



SA-305A-1 Harping matrix for footage group 3



S-outputs with more than one octave: $S_{10} + S_{11} = S_{10'}$
 $S_{21} + S_{23} = S_{21'}$



S-outputs with more than one octave: $S_{29} + S_{30} = S_{29}'$
 $S_{40} + S_{41} = S_{40}'$

2. Filter circuitry

There are fixed filters for each tone; separate outputs are provided for presets and drawbars; the selector buttons determine which gate is operated to pass the signal on to the mixer.

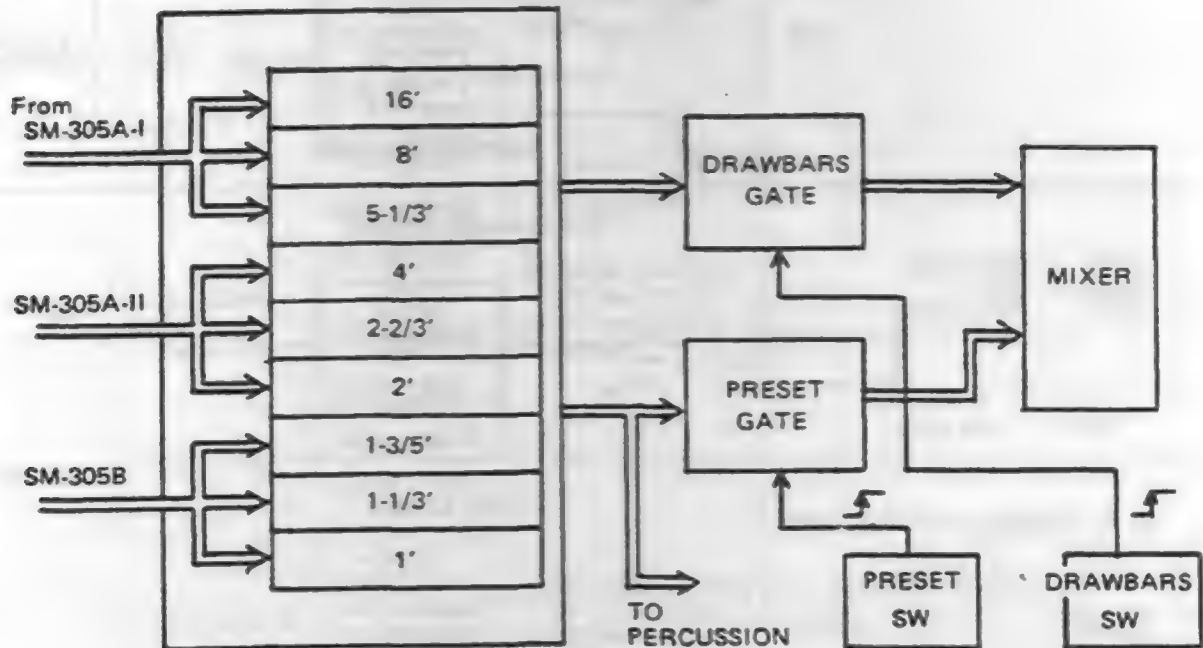
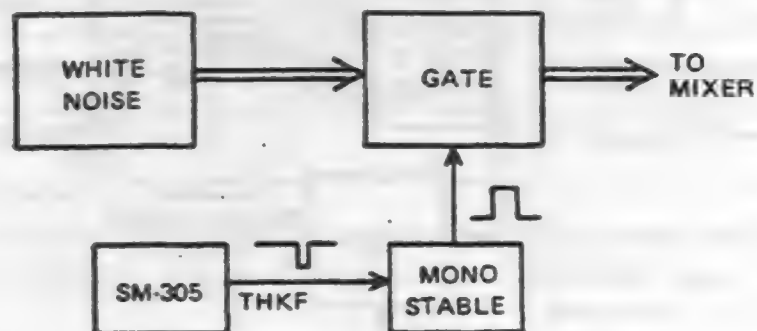


Figure 2-1 Filters

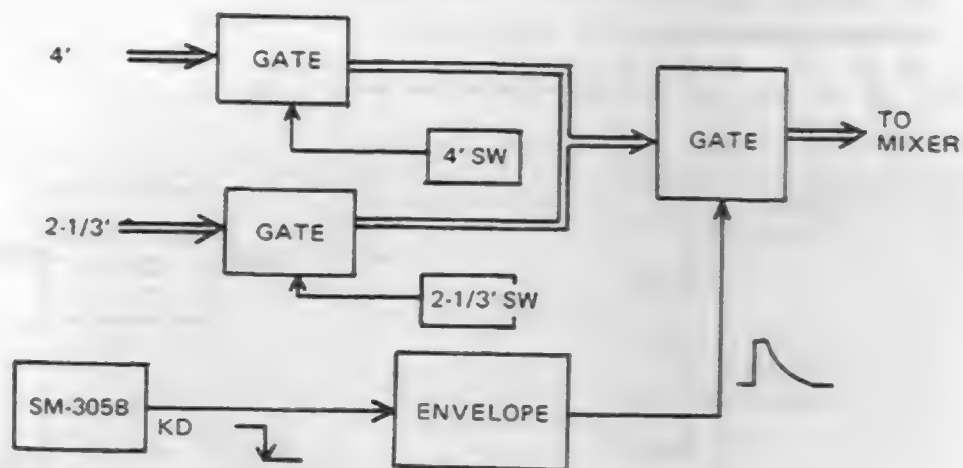
3. Key-Click circuit

White noise is used to produce the key-click effect. The SM-305A THKF (multiple trigger) controls the effect.



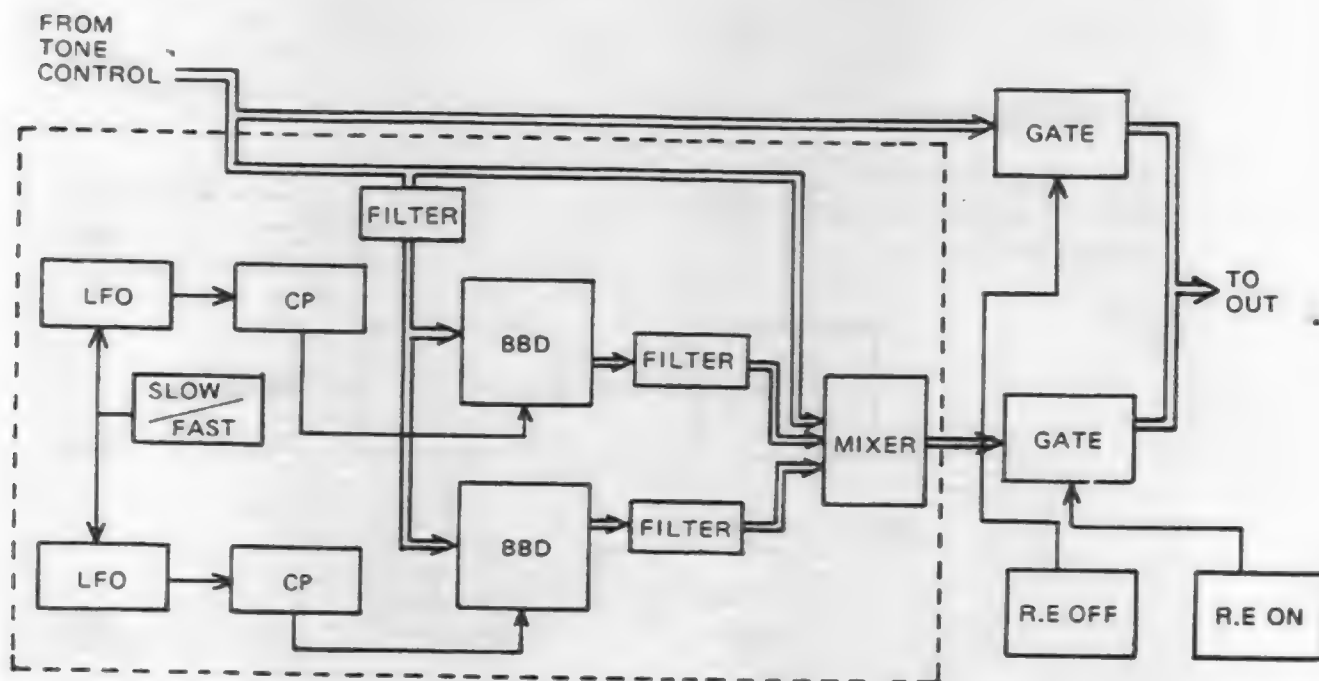
4. Percussion circuit

The percussion circuit uses 4' and 2-2/3' signals. The envelope signal which controls the effect is produced with the SM-305B KD (key-down) single trigger.



5. Rotary Effect circuit

Two BBD circuits are used to produce the rotary effect. The BBDs are IC-MN3004. Refer to the diagram



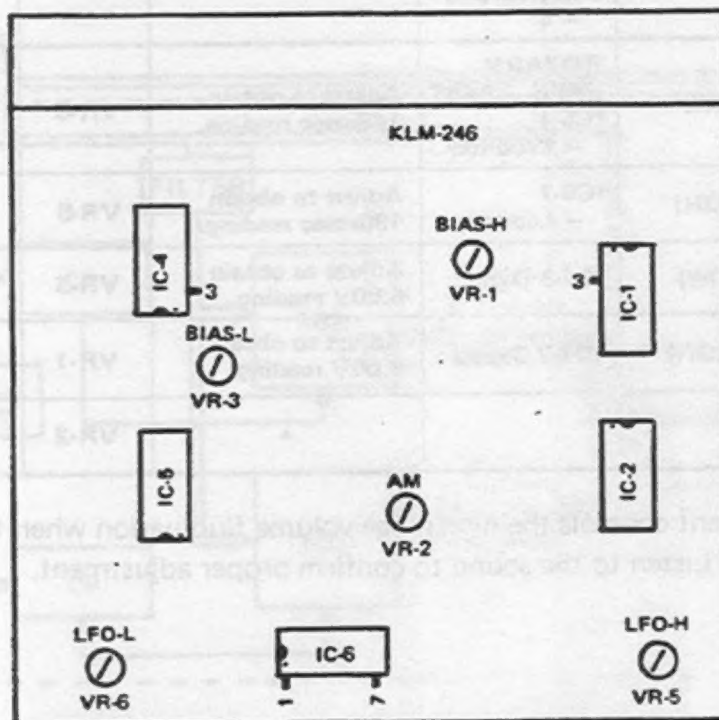
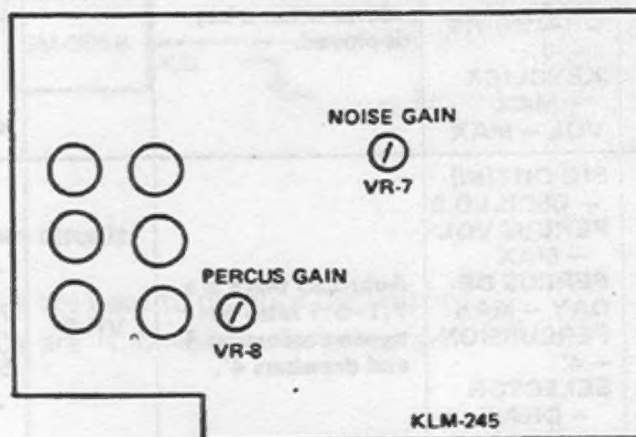
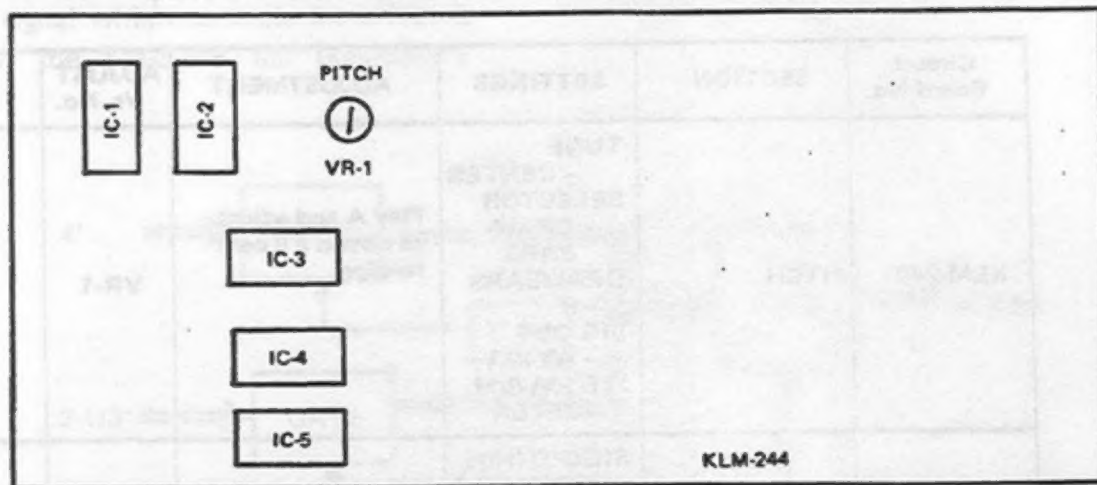
7. ADJUSTMENT PROCEDURE

Caution: Very precise adjustments have been made at the factory, so be careful not to change any setting other than that which is out of order.

| Circuit Board No. | SECTION | SETTINGS | ADJUSTMENT | ADJUST Vr. No. | Oscilloscope |
|-------------------|-------------|---|---|----------------|--------------|
| KLM-244 | PITCH | TUNE - CENTER SELECTOR - DRAW- BARS DRAWBARS - 8' SIG OUT - WT10A WT-10A-S/M - METER | Play A and adjust to obtain a 0 cent reading. | VR-1 | |
| KLM-245 | NOISE GAIN | SIGOUT(Hi) - OSCILLO.S SELECTOR - DRAW- BARS DRAWBARS - 0 KEYCLICK - MAX VOL - MAX | Adjust to get 0.5V ~0.7V key click sound when a key is played. | VR-7 | |
| | PERCUS GAIN | SIG OUT(Hi) - OSCILLO.S PERCUS VOL - MAX PERCUS DE- CAY - MAX PERCUSSION - 4' SELECTOR - DRAW- BARS DRAWBARS - 4' | Adjust so there is a 7:1~5:1 ratio between percussion 4' and drawbars 4'. | VR-8 | |
| KLM-246 | LFO (LOW) | ROTARY EFFE - FAST IC6-1 - f.counter | Adjust to obtain 145msec reading. | VR-6 | |
| | LFO (HIGH) | IC6-7 - f.counter | Adjust to obtain 130msec reading. | VR-5 | |
| | BIAS (LOW) | IC4-3-Digital | Adjust to obtain 6.00V reading. | VR-3 | |
| | BIAS (HIGH) | IC1-3-Digital | Adjust to obtain 6.00V reading. | VR-1 | |
| | AM-H | | * | VR-2 | |

* The AM-H adjustment controls the high range volume fluctuation when the rotating speaker effect is turned on. Listen to the sound to confirm proper adjustment.



Trimmer positions (reference chart)



8. PARTS LIST

(Refer to structural diagram for parts list.)

| PARTS NAME | SPECIFICATIONS | QTY | PARTS NAME | SPECIFICATIONS | QTY |
|--------------------------------------|----------------------------|-----|--------------------------------|----------------|-----|
| CARBON RESISTORS (Not Listed) | | | CERAMIC CAPACITORS | | |
| | | | 561 | (560 pF) | 4 |
| SOLID RESISTORS | | | ECK-FIE104ZFZ | (0.1 μ F) | 3 |
| 1/4W | 10MrJ | 8 | ELECTROLYTIC CAPACITORS | | |
| METAL FILM RESISTORS | | | 0.22 μ | / 50V | 1 |
| 1/4W | 1.33 K μ F | 1 | 0.47 | | |
| | 6.81 | 1 | 10 | / 16 | 24 |
| | 511 | 1 | 100 | | 5 |
| | 750 | 1 | 1000 | / 6.3V | 1 |
| | 3.32 | 1 | 220 | / 16 | 1 |
| | 3.92 | 1 | 1000 | / 6.3 | 1 |
| | 8.45 | 1 | 100 | / 16 | 2 |
| | 10 | 2 | 2200 | / 25 | 1 |
| | 20 | 1 | 22 | / 16 | 1 |
| | 30.1 | 1 | 1 | / 50 | 7 |
| | 2.32 | 0 | 10 | / 16 | 22 |
| | 2.26 | 1 | TRANSISTORS | | |
| MYLAR CAPACITORS | | | 2SC945 | LK | 55 |
| 50V | 0.001 μ F k | 3 | 2SC945 | | 4 |
| | 0.0012 | 3 | 2SC1215T | | 2 |
| | 0.0015 | 13 | 2SC644R | | 1 |
| | 0.0022 | | 2SC13849 | | 1 |
| | 0.0027 | 5 | 2SA733AK | | 2 |
| | 0.0033 | 11 | FET | | |
| | 0.0039 | 1 | 2SK30 | | 9 |
| | 0.0047 | 10 | DIODES | | |
| | 0.0068 | 8 | 1S1555 | | 40 |
| | 0.01 | 27 | 1S1885 | | 2 |
| | 0.012 | 5 | IC | | |
| | 0.022 | 13 | SM-304A | | 2 |
| | 0.033 | 2 | SM-305A | | 2 |
| | 0.047 | 5 | SM-305B | | 1 |
| | 0.068 | | NE-555 | | 1 |
| | 0.082 | 7 | S-50241 | | 1 |
| | 0.16 | 1 | MC-14069 | | 4 |
| | 0.056 | 1 | 4458 | | 10 |
| | 0.15 | 1 | MC-14046 | | 2 |
| | 0.015 | 2 | MN-3004 | | 2 |
| | 0.039 | 1 | μ PC 324 | | 1 |
| STYROL CAPACITORS | | | 14312 | (7812) | 1 |
| 47 pF | G (5%) | 1 | SEMI-FIXED RESISTORS | | |
| 120 | (1%) | 1 | 470 Ω B | H1051A | 1 |
| CERAMIC CAPACITORS | | | 150 | | 3 |
| ECK-D1H100 | Dc (10 pF) | 1 | 10KB | | 3 |
| | 120 K ₂ (12 pF) | 1 | 220 | | 1 |
| | 220 (22 pF) | 5 | 1MB | | 1 |
| | 270 (27 pF) | 1 | 100KB | | |
| | 390 (39 pF) | 7 | 1KB | | 2 |
| | 820 (82 pF) | 9 | KEYBOARD | | |
| | 101 (100 pF) | 3 | ESK307V | (61 key) | 1 |
| | 151 (150 pF) | 8 | FUSE | | |
| | 221 (220 pF) | 3 | 250V | 0.5A | 1 |
| | 231 (330 pF) | 7 | LUG BOARD | | |
| | 391 (390 pF) | 1 | L-1205-6P | | 1 |
| | 681 (680 pF) | 11 | | | |
| | 47 (47 pF) | 1 | | | |

| PARTS NAME | SPECIFICATIONS | Q'TY | PARTS NAME | PANEL INSTRUCTION | STANDARD |
|--|-------------------|------|-----------------------|-----------------------------|-------------------|
| CONNECTORS | | | POTENTIOMETERS | | |
| | CX3-1 KO-131 | 1 | | VOLUME | EVC-BO5P18B14 |
| | 132 | 1 | | KEY CLICK | EVH-8MA803A14 |
| | 121 | 1 | | TUNE | EVH-LOAS20B14 |
| | 122 | 1 | | OVER DRIVE | EVH-LOAS20B16 |
| | 123 | 1 | | BASS | EVH-LOAS20B15 |
| | 101 | 1 | | TREBLE | EVH-LOAS20B15 |
| | 91 | 1 | | PERCUS DECAY | EVH-LOAS20A55 |
| | 71 | 1 | | PERCUS VOL | EVH-LOAS20A14 |
| | 41 | 1 | | | |
| | 21 | 1 | | | |
| | 22 | 1 | | | |
| | 92 | 1 | | | |
| | 32 | 1 | | | |
| | TRC-1 | 1 | | | |
| | 100 | 1 | | | |
| TOP ENTRY | | | SLIDE VOLUME | | |
|  | 13P (B13P-SHF-1) | 2 | | DRAWBAR x 9 | S401XKA10KC |
| | 12 (B12P-SHF-1) | 3 | | | |
| | 9 (B9B-SHF-1) | 2 | | | |
| | 3 (B3P-SHF-1) | 1 | | | |
| | 2P (B2P-SHF-1) | 2 | | | |
| BOTTOM ENTRY | | | SELECT SWITCH | | |
|  | 10P (BE10P-SHF-1) | 1 | | SELECT x 8 | KHC11901 with LED |
| | 9 (BE9P-SHF-1) | 1 | | | |
| | 7 (BE7P-SHF-1) | 1 | | | |
| | 4 (BE4P-SHF-1) | 1 | | | |
| | 3 (BE3P-SHF-1) | 1 | | | |
| PRINTED CIRCUIT BOARD | | | ROTARY KNOB | | |
| | (KLM244) | 1 | | Rotary knob (Large) 18φ | |
| | (KLM245) | 1 | | Rotary knob (Small) for PS | |
| | (KLM246) | 1 | | | |
| BUSHING | | | DRAWBAR KNOB | | |
| | SR-6W-1 | 3 | | Drawbar knob 5-1/3" ~ | No.1 |
| POWER TRANSFORMER | | | | Drawbar knob 2-2/3" ~ | 2 |
| | JA-221-12 | 1 | | Drawbar knob 1-3/5" ~ Brown | 3 |
| | JB-221-12 | 1 | | Drawbar knob 1-1/3" ~ | 4 |
| BUSHING | | | | Drawbar knob 16" ~ | 5 |
| | 4K-4 | 3 | | Drawbar knob 8" ~ | 6 |
| | 5P-4 | 3 | | Drawbar knob 4" ~ | 7 |
| | | | | Drawbar knob 2" ~ Ivory | 8 |
| | | | | Drawbar knob 1" ~ | 9 |
| | | | | Select knob (gray) | |
| | | | | Select knob (Brown) | |
| | | | PHONE JACK | | |
| | | | | RETURN | 0929 |
| | | | | OTHERS x 4 | 0983 |